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WENDEROTH, LIND & PONACK, L.L.P.
2033 K STREET N. W.
SUITE 800
WASHINGTON, DC 20006-1021

EXAMINER	
COLUCCI, MICHAEL C	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/520,922	OKIMOTO ET AL.	
	Examiner	Art Unit	
	MICHAEL C. COLUCCI	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-30* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-30* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☒ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *See Continuation Sheet*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :05/03/2005, 04/11/2005, 01/12/2005.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claim 1, 13, 14, and 26-30 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-5, 7-10, 13-18, 22, 23 and 26-30 rejected under 35 U.S.C. 103(a) as being unpatentable over Rigazio et al. US 6182039 B1 (hereinafter Rigazio) in view of Pentheroudakis et al. US 7092871 B2 (hereinafter Pentheroudakis).

Re claims 1, 13, 14, and 26-30, Rigazio teaches language model generation and accumulation apparatus that generates and accumulates language models for speech recognition, the apparatus comprising:

a lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit operable to generate and accumulate a lower-level N-gram language model that is obtained by modeling a first sequence of words (Col. 4 lines 4-29) having a specific linguistic property (Col. 4 lines 30-55 & Fig. 2);

a higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit operable to generate and accumulate a higher-lever N-gram language model that is obtained by modeling the first sequence of words modeled in the lower-level N-gram language model (Col. 4 lines 4-29)

However, Rigazio fails to teach a word string class and a plurality of text as a second sequence of words that includes the word string class (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge

component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention modeling text or a plurality of text to include a word string class. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Re claims 2 and 15, Rigazio teaches the language model generation and accumulation apparatus according to Claim 1, wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit and the lower-

level N-gram language model generation and accumulation unit generate the respective language models (Col. 4 lines 4-55 & Fig. 2), using different corpuses (Col. 7 line 21 – Col. 8 line 19).

Re claims 3 and 16, Rigazio teaches the language model generation and accumulation apparatus according to Claim 2, wherein the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit includes a corpus update unit operable to update the corpus (Col. 12 lines 23-41) for the lower-level N-gram language model (Col. 4 lines 4-55 & Fig. 2),

the lower-level N-gram language model generation and accumulation unit updates the lower-level N-gram language model based on the updated corpus (Col. 12 lines 23-41), and generates the updated lower-level N-gram language model (Col. 4 lines 4-55 & Fig. 2).

Re claims 4 and 17, language model generation and accumulation apparatus according to Claim 1, wherein the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit analyzes the first sequence of words (Col. 4 lines 4-55 & Fig. 2), and generates the lower-level N-gram language model by modeling each sequence of the one or more morphemes based on the word string class (Col. 4 lines 4-55 & Fig. 2).

However, Rigazio fails to teach within the word string class into one or more morphemes that are the smallest language units having meanings (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though

they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention a word string class that is analyzed into morphemes having the smallest language unit meaning. Morphologically analyzing text or a plurality of text allows for a diverse recognition of data, where punctuation can be taken into account that links several letter/words to form a group of words. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Re claims 5 and 18, language model generation and accumulation apparatus according to Claim 1, wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit, and then generates the higher-level N-gram language model by modeling (Col. 4 lines 30-55 $ Fig. 2)

a sequence made up of the virtual word and the other words (Pentheroudakis Col. 6 line 44 – Col. 7 line 14),

substitutes the word string class with a virtual word (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

the word string class being included in each of the plurality of texts analyzed into morphemes (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the

language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention a word string class that is analyzed into morphemes having the smallest language unit meaning, where a virtual word is substituted for a sequence of words. Morphologically analyzing text or a plurality of text allows for a diverse recognition of data, where punctuation can be taken into account that links several letter/words to form a group of words. Modeling a group of words to represent one word or a virtual word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Re claims 7, 9, and 22, Rigazio teaches the language model generation and accumulation apparatus according to Claim 1, further comprising

a syntactic tree generation unit operable to perform morphemic analysis as well as syntactic analysis of a text (Col. 5 lines 42-63), and generate a syntactic tree in

which said-the text is structured by a plurality of layers, focusing on a node that is on said the syntactic tree (Col. 5 lines 42-63) and that has been selected on the basis of a predetermined criterion (Col. 4 lines 4-55 & Fig. 2),

wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the higher-level N-gram language model for syntactic tree, using a first subtree (Col. 5 lines 42-63 & Fig. 4) that constitutes an upper layer from the focused node (Col. 4 lines 4-55 & Fig. 2), and

the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the lower-level N-gram language model for syntactic tree, using a second subtree (Col. 5 lines 42-63 & Fig. 4) that constitutes a lower layer from the focused node (Col. 4 lines 4-55 & Fig. 2)

However, Rigazio fails to teach a morphemic analysis (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected

forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention a word string class that is analyzed into morphemes having the smallest language unit meaning. Morphologically analyzing text or a plurality of text allows for a diverse recognition of data, where punctuation can be taken into account that links several letter/words to form a group of words. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves.

Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Re claims 8, 10, and 23, Rigazio teaches the language model (Col. 6 lines 11-20) generation and accumulation apparatus according to Claim 7,

wherein the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit includes

a language model generation exception word judgment unit operable to judge a specific word appearing in the second subtree (Col. 5 lines 42-63)as an exception word based on a predetermined linguistic property (Col. 4 lines 30-55 $ Fig. 2), the exception word being a word not being included as a constituent word of any subtree (Col. 4 lines 30-55 $ Fig. 2),

the lower-level N-gram language model generation and accumulation unit generates the lower-level N-gram language model (Col. 4 lines 30-55 $ Fig. 2)by dividing the exception word into (i) a syllable that is a basic phonetic unit constituting a pronunciation of the word (Col. 4 lines 30-55 $ Fig. 2) and (ii) a unit that is obtained by combining syllables, and then by modeling a sequence made up of the syllable and the unit obtained by combining syllables in dependency on a location of the exception word in the syntactic tree (Col. 5 lines 42-63) and on the linguistic property of the exception word (Col. 4 lines 30-55 $ Fig. 2)

4. **Claims 6, 11, 12, 19-21 rejected under 35 U.S.C. 103(a) as being unpatentable over Rigazio et al. US 6182039 B1 (hereinafter Rigazio) in view of Pentheroudakis et al. US 7092871 B2 (hereinafter Pentheroudakis) further in view of Bakis et al. US 6023673 A (hereinafter Bakis).**

Re claims 6 and 19, Rigazio teaches the language model generation and accumulation apparatus according to Claim 1,

wherein the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit includes an exception word judgment unit operable to judge whether or not a specific word out of a plurality of words that appear in the word string class should be treated as an exception word (Col. 4 lines 4-55 & Fig. 2), based on a linguistic property of the specific word, and divides the exception word into (i) a syllable that is a basic phonetic unit constituting a pronunciation of the exception word (Col. 4 lines 4-55 & Fig. 2) and (ii) a unit that is obtained by combining syllables based on a judgment result the exception word being (Col. 4 lines 4-55 & Fig. 2),

the language model generation and accumulation apparatus further comprises a class dependent syllable N-gram generation and accumulation unit operable to generate class dependent syllable N-grams by modeling a sequence made up of the syllable and the unit obtained by combining syllables and by providing a language likelihood (Col. 1 lines 31-39) to the sequence in dependency on either the word string class or the linguistic property of the exception word (Col. 4 lines 4-55 & Fig. 2),

However, Rigazio fails to teach a word not being included as a constituent word of the word string class (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

accumulate the generated class dependent syllable N-grams (Pentheroudakis Col. 6 line 44 – Col. 7 line 14)

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic

mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

However, Rigazio in view of Pentheroudakis fails to teach the language likelihood being a logarithm value of a probability (Bakis Col. 4 line 63 – Col. 5 line 26).

Bakis teaches in order to find the best L prototypes in the target level M, likelihoods are successively calculated starting from the top level k=1. In the top level, log-likelihoods for all N.sub.1 prototypes in that level are calculated, and the results sorted. The log-likelihood is defined as the probability that the parameter values of a prototype vector signal match the feature values of a feature vector signal under consideration. Starting with the best prototype from the sorted list, i.e., the one with the highest log-likelihood.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention modeling text or a plurality of text to include a word string class, where a likelihood based on a logarithmic probability is calculated. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Additionally, using a logarithmic probability allows for the coverage of a large range of data which can be ranked when candidate matches are found, where a system that learns or is trainable can expand its models/dictionaries to a broad range through the use of a log scale.

Re claims 11 and 12, Rigazio teaches the language model generation and accumulation apparatus according to Claim 1,

wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the higher-level N-gram language model in which each (Col. 4 lines 30-55 $ Fig. 2)

However, Rigazio fails to teach a sequence of N words including the word string class is associated (Pentheroudakis Col. 6 line 44 – Col. 7 line 14)

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number

morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

However, Rigazio in view of Pentheroudakis fails to teach a probability at which said each sequence of N words (Bakis Col. 4 line 63 – Col. 5 line 26).

Bakis teaches in order to find the best L prototypes in the target level M, likelihoods are successively calculated starting from the top level k=1. In the top level, log-likelihoods for all N.sub.1 prototypes in that level are calculated, and the results sorted. The log-likelihood is defined as the probability that the parameter values of a prototype vector signal match the feature values of a feature vector signal under

consideration. Starting with the best prototype from the sorted list, i.e., the one with the highest log-likelihood.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention modeling text or a plurality of text to include a word string class, where a likelihood based on a probability is calculated. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified. Additionally, using a logarithmic probability allows for the coverage of a large range of data which can be ranked when candidate matches are found, where a system that learns or is trainable can expand its models/dictionaries to a broad range through the use of a log scale.

Re claim 20, Rigazio teaches the language model generation and accumulation apparatus according to Claim 19, further comprising

a syntactic tree generation unit operable to perform morphemic analysis as well as syntactic analysis of a text (Col. 5 lines 42-63), and generate a syntactic tree in which said-the text is structured by a plurality of layers, focusing on a node that is on said the syntactic tree (Col. 5 lines 42-63) and that has been selected on the basis of a predetermined criterion (Col. 4 lines 4-55 & Fig. 2),

wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the higher-level N-gram language model for syntactic tree, using a first subtree (Col. 5 lines 42-63 & Fig. 4) that constitutes an upper layer from the focused node (Col. 4 lines 4-55 & Fig. 2), and

the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the lower-level N-gram language model for syntactic tree, using a second subtree (Col. 5 lines 42-63 & Fig. 4) that constitutes a lower layer from the focused node (Col. 4 lines 4-55 & Fig. 2)

the speech recognition apparatus comprises:

an acoustic processing unit operable to generate feature parameters from the speech (Col. 4 lines 30-55 $ Fig. 2);

a word comparison unit operable to compare a pronunciation of each word with each of the feature parameters (Col. 4 lines 30-55 $ Fig. 2), and generate a set of word hypotheses including an utterance segment of each word and an acoustic likelihood of each word (Col. 1 lines 31-39);

a word string hypothesis (Col. 12 lines 23-41) generation unit operable to generate a word string hypothesis from the set of word hypotheses with reference to the higher-level N-gram language model for syntactic tree (Col. 5 lines 42-63) and the lower-level N-gram language model for syntactic tree (Col. 5 lines 42-63), and generate a result of the speech recognition

However, Rigazio fails to teach a morphemic analysis (Pentheroudakis Col. 6 line 44 – Col. 7 line 14).

Pentheroudakis teaches a classification of words or a group of words that can represent a title, where a lexicon lookup engine 208 first accesses lexicon 212, which may illustratively be a computer readable dictionary, or simply a word list, to determine whether the tokens in the proposed segmentation are recognized by, or contained in, lexicon 212. In addition, linguistic knowledge component 206 may include morphological analyzer 210. For example, if lexicon 212 contains only uninflected word forms (i.e., lemmas), then a morphological analysis is desirable to reduce, say the token "brothers-in-law" to the dictionary form "brother-in-law." Pentheroudakis teaches a morphological analyzer 210 can also do more than simply convert words to uninflected forms. For example, morphological analyzer 210 also illustratively includes a number morphological component 216 and a punctuation morphological component 218. These two components illustratively convert numbers and punctuation characters to values which will be recognized by lexicon 212 as well. Additionally, if a sub-token is successfully looked up in lexicon 212, and thus validated by linguistic knowledge component 206, that sub-token will not be further broken down. Instead, it is simply passed back to tokenizer engine 202 along with an indication that it has been validated.

Pentheroudakis teaches a linguistic knowledge component 206 also illustratively invokes morphological analyzer 210 to assist in recognizing "virtual" words in the language (tokens that need to be treated as single words by the system, even though they are not listed in the dictionary). For instance, tokens such as numbers, electronic mail addresses, drive path names, URLs, emoticons, and the like, can be represented as a single word. Morphological analyzer 210 can assist in recognizing each segment

as an actual word, or as a virtual word, by identifying it as a virtual word or reducing it to a normalized form for recognition in lexicon 212.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention a word string class that is analyzed into morphemes having the smallest language unit meaning. Morphologically analyzing text or a plurality of text allows for a diverse recognition of data, where punctuation can be taken into account that links several letter/words to form a group of words. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified.

Re claim 21, Rigazio teaches the apparatus according to Claim 20,

wherein the lower-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit includes

a language model generation exception word judgment unit operable to judge a specific word appearing in the second subtree (Col. 5 lines 42-63)as an exception word based on a predetermined linguistic property (Col. 4 lines 30-55 $ Fig. 2), the exception word being a word not being included as a constituent word of any subtree (Col. 4 lines 30-55 $ Fig. 2),

the lower-level N-gram language model generation and accumulation unit generates the lower-level N-gram language model (Col. 4 lines 30-55 $ Fig. 2)by dividing the exception word into (i) a syllable that is a basic phonetic unit constituting a pronunciation of the word (Col. 4 lines 30-55 $ Fig. 2) and (ii) a unit that is obtained by combining syllables, and then by modeling a sequence made up of the syllable and the unit obtained by combining syllables in dependency on a location of the exception word in the syntactic tree (Col. 5 lines 42-63) and on the linguistic property of the exception word (Col. 4 lines 30-55 $ Fig. 2)

the word string hypothesis generation unit generates the result of the speech recognition (Col. 12 lines 23-41).

Re claims 24 and 25, Rigazio teaches the speech recognition apparatus according to Claim 14,

wherein the higher-level N-gram language model (Col. 6 lines 11-20) generation and accumulation unit generates the higher-level N-gram language model in which each sequence of N words (Col. 4 lines 30-55 $ Fig. 2)

the speech recognition apparatus comprises

a word string hypothesis generation unit operable to evaluate a word string hypothesis (Col. 12 lines 23-41).

However, Rigazio in view of Pentheroudakis fails to teach including the word string class is associated with a probability at which the each sequence of words occurs (Bakis Col. 4 line 63 – Col. 5 line 26),

multiplying each probability at which the each sequence of N words including the word string class occurs (Bakis Col. 4 line 63 – Col. 5 line 26).

Bakis teaches in order to find the best L prototypes in the target level M, likelihoods are successively calculated starting from the top level k=1. In the top level, log-likelihoods for all N.sub.1 prototypes in that level are calculated, and the results sorted. The log-likelihood is defined as the probability that the parameter values of a prototype vector signal match the feature values of a feature vector signal under consideration. Starting with the best prototype from the sorted list, i.e., the one with the highest log-likelihood.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention modeling text or a plurality of text to include a word string class, where a likelihood based on a probability is calculated. Modeling a group of words to represent one word allows for the recognition of a unique *sequence of words* that are not considered to be words them selves but can be categorized as a word themselves. Creating a system to recognize groups of words allows for a reduced amount of error during speech recognition, where punctuation (i.e. "-", "/", ".", etc) will be considered in a manner in which any title or name can be recognized and classified. Additionally, the multiplication by a probability allows for a score to be generated based on a hierarchical data set for the purpose of ranking, such as after a word/string is classified, ranking the classification further to prune any lower ranked candidates by the scaled or multiplied probability.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US 6243669 B1, US 4797930 A, US 6654721 B2, US 5477451 A, US 5510981 A, US 5870706 A, US 20020032564 A1, US 20020042707 A1, US 6336108 B1, US 6839669 B1.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael C. Colucci whose telephone number is (571)-270-1847. The examiner can normally be reached on 9:30 am - 6:00 pm, Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (571)-272-7602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Michael Colucci Jr.
Patent Examiner
AU 2626
(571)-270-1847
Michael.Colucci@uspto.gov

RICHEMOND DORVIL
SUPERVISORY PATENT EXAMINER